EMEM 440
Winter 2012-13 (122)
Assignment #1

1. The following equation can be used to compute values of y as a function of x:

    $$y = be^{-ax} \sin(bx) (0.012 \, x^4 - 0.15 \, x^3 + 0.075 \, x^2 + 2.5 \, x)$$

    With a = 2 and b = 5, use Matlab to create an array of y values for x from 0 to $\pi/2$ in increments of $\pi/40$. Then calculate an array of values for $z = y^2$ for each value of x. Generate a labeled plot of y and z versus x with y plotted as a solid line and z with symbols and no line. Add labels to each axis, a title, and a legend.

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2. Manning's equation can be used to compute the velocity of water in a rectangular open channel:

    $$U = \frac{\overline{S}}{n} \left(\frac{BH}{B + 2H}\right)^{0.667}$$

    where U = velocity (m/s), S= channel slope, n = roughness coefficient, B = width (m), and H = depth (m). The following data are obtained for five channels:

n	S	B	H
0.035	0.0001	10	2
0.020	0.0002	8	1
0.015	0.0010	20	1.5
0.030	0.0007	24	3
0.022	0.0003	15	2.5

    Store these values in a matrix where each row represents one of the channels and each column represents one of the parameters. Write a single line Matlab statement to compute a column vector containing the velocities based on the values in the parameter matrix you created.

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3. The following data was obtained for concentration (c) versus time (t) for a chemical reaction:

t (min)	10	20	30	40	50	60
c (ppm)	3.4	2.6	1.6	1.3	1.0	0.5

The data can be described by the following relation:

$$c = 4.84\, e^{-0.034\, t}$$

Use Matlab to create a plot displaying both the data (using diamond symbols) and the function (using a dotted line). Plot the function for t = 0 to 70 minutes. Label the plot axes and place a title at the top.

Plus text Problems:

2.9, 2.18, 2.22